

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NORTH CAROLINA
WESTERN DIVISION**

GRAHAM YATES and)	EDNC File No.5:12-cv-00752-FL
BECKY YATES, spouse,)	
)	
Plaintiffs,)	
)	
v.)	
)	
FORD MOTOR COMPANY, et al.,)	
)	
)	
Defendants.)	

**PLAINTIFFS' MEMORANDUM OF LAW OPPOSING DEFENDANT HONEYWELL INT'L
INC.'S MOTION *IN LIMINE* TO PRECLUDE EVIDENCE SUGGESTING THAT BRAKE DUST
CAUSES PLEURAL MESOTHELIOMA OR THAT "EVERY EXPOSURE COUNTS"**

Plaintiffs oppose Defendant Honeywell International Inc.'s ("Honeywell") Motion *in Limine* (Doc. 296), which was joined by Defendant Ford Motor Company ("Ford") (Doc. 312), and would respectfully show the Court that this motion should be denied.

I. INTRODUCTION

Defendants ask this Court to preclude testimony from Plaintiffs' causation expert, pathologist Dr. Eugene Mark, that exposure to asbestos brakes causes pleural mesothelioma and that "every exposure" to asbestos causes mesothelioma.¹ Ignoring the multi-step scientific methodology and the wealth of scientific research supporting Dr. Mark's opinions in this case, Defendants argue that his opinions are not based on reliable facts or methods. Nothing could be further from the truth. In fact, the same opinions expressed by Dr. Mark have been expressed not only by Honeywell's own expert in this case, Dr. Victor Roggli, but by Honeywell itself in documents generated outside the context of litigation. The evidence

¹ Plaintiffs will also be offering causation testimony from Dr. Arnold Brody, a cellular biologist. Dr. Brody will only testify about general causation, however. *See, e.g., Larson v. Bondex Int'l*, No. 09-69123, 2010 WL 4676563, at *4 (E.D. Penn. Nov. 15, 2010) (noting that the purpose of Dr. Brody's testimony is "to assist the jury in understanding the relationship between exposure to asbestos fibers and disease processes generally"). The scientific foundation discussed herein is also applicable to Dr. Brody's opinions, as he and Dr. Mark both express the consensus view of the scientific and medical communities regarding the causation of asbestos-related diseases.

shows that Honeywell's false assertion that asbestos brakes have not been linked to mesothelioma is part of a concerted effort on the part of the automobile industry to conceal the true hazards of asbestos brakes.

As an initial matter, Plaintiffs must clarify that, contrary to Defendants' mischaracterization, Dr. Mark does not hold the opinion that "every exposure" to asbestos causes mesothelioma. He instead will testify that mesothelioma is caused by a person's cumulative asbestos exposure and that exposures that contribute to the cumulative dose by meeting certain well-defined criteria can be considered a substantial factor in causing the mesothelioma. Numerous state and federal courts have rejected similar mischaracterizations of Dr. Mark's opinions and have admitted his causation testimony as reliable and helpful to the trier of fact.

Interestingly, Honeywell's own expert, Dr. Victor Roggli, holds the *exact opinions* that Defendants challenge in this case, including that chrysotile asbestos causes mesothelioma, that there is no established threshold for the induction of mesothelioma, that low occupational exposures have been found causative of mesothelioma in the scientific literature, that it is the cumulative exposure that causes disease, and that each exposure above background levels is a substantial factor in causing mesothelioma. *See Ex. 1, Roggli Affidavit, 5/29/01.* Dr. Roggli has testified in relevant part that:

- **"Science has not demonstrated any cause of mesothelioma in the workplace other than exposure to all forms of asbestos dust,** which makes it a signal malignancy, i.e., an epidemiological marker for exposure to asbestos."
- **"Because asbestos dust is so strongly associated with mesothelioma, proof of significant exposure to asbestos dust is proof of specific causation."**
- **"The overwhelming world scientific consensus is that dust from all three commercial types of asbestos** incorporated in products manufactured in the United States, amosite and crocidolite from South Africa and **chrysotile from Canada, are all capable of causing mesothelioma."**
- **"Indeed, the causal relationship between exposure to all forms of asbestos dust and the development of mesothelioma is so firmly established in the medical and scientific literature that it is accepted as scientific 'fact.'"**
- "The scientific and medical community has yet to determine a level of exposure to asbestos below which mesothelioma will not occur."

- “Very low levels of exposure above background, however, have been demonstrated to cause mesothelioma.”
- “It is also my opinion that it is **the total dose of asbestos, regardless of fiber type, that the patient experiences that causes the disease.**”
- “It is further my opinion that **each and every exposure to asbestos that an individual with mesothelioma experienced in excess of background level is a substantial contributing factor in the development of the disease.**”

Roggli Affidavit at 2-3 (emphasis added).

Dr. Roggli has reiterated these opinions multiple times. He signed an affidavit in 2005 that contains all of these same opinions. **Ex. 2**, Roggli Affidavit, 5/20/05, at 2. In 2007, Dr. Roggli testified that it is the consensus opinion among experts in asbestos disease that chrysotile asbestos causes mesothelioma. **Ex. 3**, Deposition of Victor Roggli, M.D., *Pounds v. Alfa Laval, Inc., et al.*, 5/8/07, at 46:18-47:7. He acknowledged that chrysotile asbestos products typically contain tremolite asbestos, an amphibole fiber, and that tremolite asbestos causes mesothelioma. *Id.* at 53:20-54:14, 56:25-57:7, 57:24-58:5. He agreed that there is no identified threshold of asbestos exposure below which mesothelioma will not occur in humans. *Id.* at 59:2-8. He agreed that mesothelioma is a cumulative disease and that each exposure above background contributes to the total dose, increases the risk of disease, and shortens the latency time period in which the disease develops. *Id.* at 62:2-8, 62:17-63:16.

As recently as last month, Dr. Roggli was still testifying that all forms of asbestos, which would include chrysotile asbestos, cause mesothelioma:

Q. And, Dr. Roggli, do you agree with the following:

The causal relationship between asbestos exposure to all forms of asbestos dust and the development of mesothelioma is so firmly established in the medical and scientific literature that it is accepted as scientific fact.

In this respect, it's like the relationship between smoking and lung cancer, HIV and aids, or even water in the lungs and drowning?

THE WITNESS: Yes.

Ex. 4, Deposition of Victor Roggli, M.D., *Winkel v. Calaveras Asbestos, Ltd., et al.*, 3/10/15, at 91:12-24 (objection omitted). Dr. Roggli again expressed his opinion that the scientific community has never identified a safe level of asbestos exposure. *Id.* at 53:13-17. In his own medical practice, Dr. Roggli has

seen cases of mesothelioma caused by as little as one month of total asbestos exposure. *Id.* at 53:18-21. He believes that all exposures to asbestos that accumulate in the lung above background levels contribute to cause mesothelioma. *Id.* at 53:22-54:14. Dr. Roggli has also found in his own research that each exposure above background shortens the latency period, and agrees that if a person is spared an exposure above background their disease will take longer to develop. *Id.* at 54:15-55:21. He further agrees that it has been known in the medical literature since 1930 that reducing asbestos exposures will delay the onset of the disease. *Id.* at 55:22-56:1; *see also* **Exs. 67, 68, and 81.**

Dr. Roggli's *agreement* with Dr. Mark on these matters illustrates that Dr. Mark's opinions represent the scientific consensus regarding the causation of mesothelioma from all types of asbestos exposure, including chrysotile asbestos. Indeed, both Honeywell and Ford have recognized that fact outside the context of litigation. In 1994, Ford's issued an instruction manual for its mechanics titled "General Brakes Theory and Operation," in which it flat out states that dust present on Ford brake assemblies may contain asbestos and that breathing the dust from its brakes can cause cancer. **Ex. 38**, Ford Brake Systems, General Brakes Theory and Operation: Self-Study Student Reference Book, at second page.

Similarly, in 1986, its Material Safety Data Sheet for "Bendix Friction Materials," the very product at issue in this case, Honeywell states that its product can cause mesothelioma. **Ex. 5**, Allied-Signal, Inc., Bendix Friction Materials Division, Material Safety Data Sheet, at Section VI ("Health Hazard Data"). It further states that "machining (grinding or drilling) and/or normal use may create asbestos dust or airborne asbestos fibers in excess of OSHA standard [sic] and should be considered hazardous." *Id.* at Section IX ("Special Precautions"). In addition, Honeywell's own asbestos standard governing its facilities worldwide recognizes the extreme dangers of asbestos. It provides that asbestos-containing materials (ACM) should not even be purchased for use in Honeywell facilities. **Ex. 6**, Honeywell HSE Management System, Level 2 Standard, Industrial Hygiene, Asbestos, Effective Date 1/31/13, at 2. The standard states that if employees encounter ACM, "including encapsulated materials," they must stop work on notify their supervisor immediately. *Id.* Honeywell's standard in fact *prohibits* the

“[d]ry machining, cutting, grinding, sanding or abrading of ACM (friable and non-friable).” *Id.* The standard recognizes that, “the OEL’s [Occupational Exposure Limits] were established at the lowest exposure levels that could be reliably measured and there is evidence suggesting that chronic exposures to asbestos at levels below the OEL’s pose sufficient risk to justify the use of respirators whenever engaged in Asbestos Work.” *Id.* at 10. Honeywell also defines asbestos to include chrysotile asbestos. *Id.* at 9.

The foundation for Dr. Mark’s causation opinions is set forth at length herein, but Dr. Roggli’s and Honeywell’s own statements establish that Dr. Mark’s opinions are reliable and represent the consensus view that low levels of asbestos exposure causes mesothelioma, chrysotile asbestos causes mesothelioma, and Defendants’ asbestos brake friction products cause mesothelioma. Defendants’ motion should therefore be denied.

II. DR. MARK DOES NOT HOLD THE “EVERY EXPOSURE COUNTS” OPINION.

Dr. Mark is an extremely well qualified pathologist whose expertise in asbestos-related disease has been recognized by courts across the country. He received his medical degree from Harvard Medical School in 1967. **Ex. 7**, Expert Report and Declaration of Eugene Mark, M.D., August 2013, at 2-3; **Ex. 8**, Curriculum Vitae. He is board certified by the American Board of Pathology in Pathologic Anatomy, Clinical Pathology and Dermatopathology. He is a pathologist at Massachusetts General Hospital, as well as a full Professor of Pathology at Massachusetts General Hospital, Harvard Medical School, where he has taught since 1974. He has published almost 300 articles in the peer-reviewed literature, many on asbestos-related diseases. *See, e.g.*, **Exs. 78-80**.

Dr. Mark’s opinions in this case are contained in his Report dated June 17, 2013, (**Ex. 9**), his Report and Declaration dated August 1, 2013 (**Ex. 7**), and his deposition taken on March 16, 2015. (**Ex. 10**). In reaching his opinions about the causative role of Graham Yates’s exposure to asbestos brake friction products, Dr. Mark relied on a multiple-step scientific methodology, including substantial epidemiology and other scientific literature establishing that asbestos exposure causes disease, as well as case-specific data regarding the details of Yates’s exposure to asbestos from his work with and around asbestos brakes. Dr. Mark’s report explains that he utilizes the scientific method to determine the

question of general causation, including the nine Bradford-Hill criteria for establishing causation of disease. Mark Report and Declaration, August 2013, at 9-10. He takes a multi-disciplinary approach that considers the entirety of the scientific literature, including, among other things, epidemiology, industrial hygiene, experimental issues, biology, molecular medicine, and movement of fibers. Mark Depo. at 55:21-56:16, 69:20-70:2.

Dr. Mark is of the opinion that mesothelioma is caused by a person's cumulative asbestos exposure. Mark Report, June 2013, at 3; Mark Report at 2, 11-12, 28. "The total and cumulative exposure to asbestos from all the special exposures prior to the occurrence of a diffuse malignant mesothelioma causes the diffuse malignant mesothelioma, and each of the special exposures contributes to its pathogenesis." Mark Report, June 2013, at 3. A "special exposure" is shorthand for those types of exposures that the scientific literature has shown create a risk of developing diffuse malignant mesothelioma. *Id.*; Mark Depo. at 48:8-12. In other words, there must be "scientific evidence" to include that an exposure increases the risk of disease before the exposure can be considered a substantial factor in causing the disease. Mark Depo. at 48:13-20, 74:20-75:5. In determining whether an exposure was a substantial factor in causing the plaintiff's disease, Dr. Mark testified that he considers many factors: "I would take in to account many issues including the type of work, how the work was done, the duration, intensity, and proximity . . . [and] the different fiber types" Mark Depo. at 76:11-15.

It is absolutely untrue that "Dr. Mark reaches his causation opinions in this case without regard to Mr. Yates' alleged dose of brake dust from Bendix brakes." (Doc. 296 at 16). Dr. Mark's opinions are firmly grounded in the exposure evidence in this case. He reviewed and relied on Yates's testimony about exposure to visible dust when changing brakes on his own cars, working at an Esso gas station in the 1950s, and working as a parts handler at a Ford dealership in the 1960s. Mark Report and Declaration, August 2013, at 4-5. In his deposition, he described that Yates was exposed to asbestos brakes over a period of years. Mark Depo. at 81:23-82:19. Dr. Mark noted a number of studies showing that the activities described by Yates—including cleaning brake drums, sanding new brake pads, handling brake boxes, and sweeping up after brake changes—resulted in substantial exposures to asbestos. Mark Report

and Declaration, August 2013, at 5-7.² He concluded that, “[b]ased on my review of this literature, and the work practices described by Mr. Graham Yates, it is my opinion that the work with asbestos brakes performed by Mr. Graham Yates and others in his presence caused him to be exposed to asbestos substantially above background levels, as defined by both Nicholson and the Environmental Protection Agency.” *Id.* at 7. He lists numerous scientific articles that support his opinion that Yates’s brake exposures were a substantial contributing factor in the development of his mesothelioma. *Id.* at 7-9.

Dr. Mark’s report also discusses the substantial body of literature finding that mesothelioma is caused by brief and low level exposures to asbestos. *Id.* at 17-23. Dr. Mark compared Yates’s exposure history to the scientific literature and stated his conclusion that Yates “was exposed to a range of exposures that have been shown in the literature cited herein to cause diffuse malignant mesothelioma.” *Id.* at 28. Dr. Mark is of the opinion that Yates’s exposures to Bendix and Ford brake friction products were substantial contributing factors in causing Yates’s mesothelioma. *Id.* at 7, 29.

Defendants attempt to distort Dr. Mark’s opinion by contending that he is expected to testify that if a person has mesothelioma and “there is evidence of *any* asbestos exposure (regardless of fiber type of dose), the disease was caused by asbestos,” and that “Mr. Yates’s mesothelioma was caused by exposure to brake dust, no matter how slight or theoretical.” (Doc. 296 at 2.) Dr. Mark in fact testified that he would not simply attribute mesothelioma to asbestos exposure simply based on the fact of diagnosis. Mark Depo. at 25:13-17. He further explained that he does not believe that the mere presence of asbestos fibers in the lungs would be sufficient to indicate an increased risk of developing mesothelioma. *Id.* at 79:15-21. He does not believe that trivial exposures are causative, and explained that a trivial exposure would be one where there was no scientific evidence to conclude that there is an increased risk of disease. *Id.* at 49:14-25.

Defendants did not even ask Dr. Mark whether he holds the opinion they seek to exclude, *i.e.*, that “all exposures count” to cause disease. They did not ask him that question because they know that is not his opinion. As he recently testified in another case, “I do not think that one individual fiber can

² Dr. Mark also relied on the expert report of Plaintiff’s expert in industrial hygiene, Steve Hays. **Ex. 39.**

cause disease.” **Ex. 11**, Deposition of Dr. Eugene Mark, *Cowan v. Agco Corp., et al.*, 8/7/13, at 67:16-22. He further elaborated that it would not be a special exposure to be exposed to an asbestos product on only one occasion because “there is no scientific reason or evidence to show you that that type of single exposure causes increased risk of disease.” *Id.* at 68:12-69:9.

Indeed, Courts that have accepted Dr. Mark’s causation testimony in asbestos cases have rejected Defendants’ mischaracterization of his opinion. For example, in *Mahoney v. Georgi-Pacific, LLC*, No. A122038, 2009 WL 3451754 (Cal. App. Ct. Oct. 27, 2009) (**Ex. 12**), the plaintiff offered Dr. Mark’s testimony that her asbestos exposure from Georgia-Pacific joint compound through sanding and clean-up activities was a substantial contributing factor in the development of her mesothelioma. *See id.* at *2. In considering Georgia-Pacific’s challenge to this testimony on appeal, the court noted that Dr. Mark is “a Harvard-educated physician and pathologist who taught at Harvard Medical School,” and that he has “considerable expertise in asbestos diseases, including mesothelioma.” *Id.* The court clarified that Dr. Mark had not testified that “any exposure” to asbestos causes mesothelioma, but rather his opinion is that each “special exposure” to asbestos was a contributing factor to the Plaintiff’s disease. *See id.* at *3, *6 n.6. Special exposures include repeated occupational exposures to asbestos products. *See id.* at *3. The court held that Dr. Mark’s causation opinion was sufficiently supported by the facts regarding the plaintiff’s exposure to asbestos dust from joint compound products, and that his opinion should not be excluded. *See id.* at *5, *6 n.6.

An appellate court in Louisiana has come to the same conclusion. *See Robertson v. Doug Ashy Bldg. Materials, Inc.*, 77 So. 3d 339, 354 (La. App. 1 Cir. 10/4/11) (**Ex. 13**). That court reversed the trial court’s exclusion of Dr. Mark’s causation testimony, beginning with the observation that, “[f]irst and foremost, we agree with the plaintiffs that both Sherwin–Williams and the trial court have mischaracterized the substance of Dr. Mark’s testimony. We have reviewed the affidavit and the expert report attached thereto of Dr. Mark that are contained in the record and do not see that Dr. Mark opined that every single asbestos fiber inhaled contributes to an individual’s mesothelioma or that the inhalation of a single asbestos fiber was sufficient to cause mesothelioma.” *Id.* The court found that it was error to

exclude Dr. Mark's special exposure opinions, as the defendant had not shown that his opinions lacked a reliable foundation. *See id.* at 359.

Numerous other courts have recently admitted Dr. Mark's causation opinions as reliable and admissible, specifically noting that his causation opinions were based on the particular facts of the plaintiff's exposure history. *See, e.g., Ex. 14, Hill v. Air & Liquid Systems Corp.*, Tentative Order re Motion to Exclude Plaintiffs' Experts (C.D. Cal. Oct. 30, 2014); **Ex. 15, Bobo v. TVA**, No. 12-S-1930-NE, 2014 U.S. Dist. LEXIS 117917, at *24-*28 (N.D. Ala. Aug. 25, 2014); **Ex. 16, Kinseth v. A.Y. McDonald Industries, Inc.**, Ruling on Motions to Exclude, at 11-13 (Iowa Dist. Ct. Feb. 26, 2014).

III. LEGAL STANDARDS FOR THE ADMISSIBILITY OF EXPERT TESTIMONY.

The prerequisites for an expert witness to give opinion testimony are that "(1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case." FED. R. EVID. 702. In *Daubert v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579 (1993), the U.S. Supreme Court held that expert testimony need be based only on a reliable and scientifically valid methodology that fits with the facts of a case. *See Heller v. Shaw Indus., Inc.*, 167 F.3d 146, 152 (3d Cir. 1999) (citing *Daubert*, 509 U.S. at 592-93). The Supreme Court "listed four factors to guide a district court in its preliminary assessment of these requirements,"³ but cautioned that these were guideposts and not required factors in each case." *Id.* Rather, "these factors should not obscure the fact that the district court's gatekeeper role is a flexible one, and that the factors are simply useful signposts, not dispositive hurdles that a party must overcome in order to have expert testimony admitted." *Id.* (citing *Daubert*, 509 U.S. at 593-94 & n.12).

Importantly, the trial court's gatekeeper role is not intended to replace the adversary system. *See Maiz v. Virani*, 253 F.3d 641, 666 (11th Cir. 2001). Rather, as the Court specifically recognized in

³ The *Daubert* factors include: (1) whether an expert's theory can be tested; (2) whether the theory or technique has been subjected to peer review or publication; (3) whether there is a known potential rate of error; and (4) whether there is widespread acceptance of the theory or technique in the relevant scientific community. *Daubert*, 509 U.S. at 593-94. *Kumho*, like Section 2702 of the Oklahoma Evidence Code, does not appear to draw a distinction between "scientific" evidence and "technical" or "other specialized" knowledge. *Christian*, 65 P.3d at 599.

Daubert, “cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof” are the ordinary means to attack an opposing expert. *Daubert*, 509 U.S. at 596.

Trial courts may not exercise their gatekeeping responsibility by excluding expert testimony that falls within the range of matters on which reasonable experts can disagree. *See Milward v. Acuity Specialty Prods. Group, Inc.*, 639 F.3d 11, 22 (1st Cir. 2011). Trial courts are not “empowered ‘to determine which of several competing scientific theories has the best provenance.’” *Id.* at 15 (quoting *Ruiz-Troche v. Pepsi Cola of P.R. Bottling Co.*, 161 F.3d 77, 85 (1st Cir. 1998)). While the trial court may look at the reliability of the expert’s methodology, it is for the jury to determine the soundness of the facts underlying the expert’s opinion and the correctness of his or her conclusions. *See id.* 22. The entire body of evidence relied on by the expert should be taken into consideration in evaluating the reliability of the opinion, and the court should refrain from an “atomistic” approach that determines that each piece of evidence is insufficient, on its own, to support the expert’s conclusion. *Id.* The mere fact that an expert’s methodology requires the application of scientific judgment does not render it unreliable. *See id.* at 18.

IV. DR. MARK’S OPINIONS ARE BASED ON RELIABLE SCIENCE AND ARE ACCEPTED IN THE SCIENTIFIC COMMUNITY.⁴

A. There has never been a known “safe” level of exposure to asbestos and low exposures to asbestos are known to cause mesothelioma.

Dr. Mark’s opinions regarding the cumulative nature of asbestos diseases and the significance of each special exposure to asbestos are not “unreliable,” but are well-grounded in an abundance of medical and scientific evidence and are accepted as the consensus causation opinion by the vast majority of the medical and scientific communities, including government agencies and independent experts from numerous national and international institutions.

It is undisputed that mesothelioma is a signal tumor for exposure to asbestos. Given the undeniable link between exposure to asbestos and mesothelioma, universally accepted attribution criteria acknowledge that “a history of significant occupational, domestic, or environmental exposure to asbestos

⁴ This Brief discusses voluminous scientific literature supporting Dr. Mark’s opinions. For the sake of economy and efficiency, Plaintiffs have only attached some of the key articles as exhibits. Plaintiffs will promptly provide additional cited articles to the Court upon request.

will suffice for attribution.” **Ex. 17**, *Consensus Report: Asbestos, asbestosis, and cancer: the Helsinki criteria for diagnosis and attribution*, SCAND J WORK ENVIRON HEALTH, 23:311-6 (1997) (“Consensus Report”). This consensus opinion was reached in 1997 by a group of 19 experts from 8 different countries who met in Helsinki, Finland “to discuss disorders of the lung and pleura in association with asbestos and to agree upon state-of-the-art criteria for their diagnosis and attribution with respect to asbestos.” *Id.* at 311. In rendering criteria on the attribution of mesothelioma, the Consensus Panel considered the following generally accepted concepts regarding mesothelioma:

- The great majority of mesotheliomas are due to asbestos exposure.
- Mesothelioma can occur in cases with low asbestos exposure
- An occupational history of brief or low-level exposure should be considered sufficient for mesothelioma to be designated as occupationally related.
- A minimum of 10 years from the first exposure is required to attribute the mesothelioma to asbestos exposure, though in most cases the latency interval is longer (e.g., on the order of 30 to 40 years).

Id. at 313. The Helsinki Criteria does not require a quantitative estimate of a patient’s asbestos “dose” exceeding some undefined level in order to attribute mesothelioma to a given asbestos exposure.

Dr. Mark’s opinion that exposures meeting certain criteria contribute to the aggregate dose that ultimately caused Graham Yates’s mesothelioma is premised on many of these findings from the Consensus Report. As succinctly stated by the U.S. Environmental Protection Agency (“EPA”): “Because asbestos fibers remain in the body, each exposure increases the likelihood of developing an asbestos-related disease.” **Ex. 40**, *Guide for Ship Scrappers: Tips for Regulatory Compliance*, p. 2-6 (Summer 2000).

It has been long recognized that there is no known level of asbestos exposure below which mesothelioma does not occur. In 1938, it was proposed that there be an occupational limit on exposure to dust containing asbestos fibers⁵ of 5 million particles per cubic foot (“mppcf”) to reduce the incidence of

⁵ Because of the difficulty in identifying and quantifying specific structures in air samples using the collection methods of the time, Dreessen's proposal counted *total dust particles* in the air sample, not just asbestos fibers.

pulmonary asbestosis, a non-malignant scarring of the lungs. See Schall, *Present Threshold Limit Value in the U.S.A. For Asbestos Dust: A Critique*, Occupational Health Program, New Jersey State Department of Health, ANN NY ACAD SCI, 132(1): 316-321, 316-317 (1965). Even though the American Conference of Governmental Industrial Hygienists (“ACGIH”) adopted this level of 5 mppcf as a threshold limit value (“TLV”) in 1946 and it remained so until at least 1968, the asbestos industry knew that it was not a “safe” level of exposure that would prevent asbestosis. See *Biological Effects of Asbestos, Discussion*, ANN NY ACAD SCI, 132(1):335-337, 335-36 (1965). More importantly, the ACGIH’s 5 mppcf TLV was never intended to state a safe level for any asbestos-induced malignancies, such as mesothelioma.

Numerous federal and international agencies have concluded that there is no known safe level of asbestos exposure. These include the World Health Organization (“WHO”), the International Agency for Research on Cancer (“IARC”), the EPA, The National Cancer Institute (“NCI”), the National Institutes of Occupational Safety and Health (“NIOSH”), and the Consumer Products Safety Commission (“CPSC”).

Groups of researchers continued to conclude that there is no threshold below which there is no risk from exposure to asbestos. **Ex. 18**, Landrigan et al., *The Hazards of Chrysotile Asbestos: A Critical Review*, IND HEALTH 37:271-280, 275 (1999); **Ex. 41**, Hillerdal, *Mesothelioma: Cases Associated with Non-Occupational and Low Dose Exposures*, OCCUP ENVIRON MED 56:505-513, 510 (1999).

“Low level” and “short-term” asbestos exposures have been repeatedly shown to cause mesothelioma in the peer-reviewed scientific literature. See, e.g., **Ex. 42**, Offermans et al., *Occupational Asbestos Exposure and Risk of Pleural Mesothelioma, Lung Cancer, and Laryngeal Cancer in the Prospective Netherlands Cohort Study*, J Occup Envir Med 56(1) (Jan. 2014); **Ex. 64**, Skamneritz et al., *Asbestos Exposure and Survival in Malignant Mesothelioma*, Intl J Occ Env Med 2(4):224-236 (Oct. 2011); Peto, *The Hygiene Standard for Chrysotile Asbestos*, THE LANCET 484-489, 485 (Mar. 4, 1978); Doll and Peto, *EFFECTS ON HEALTH OF EXPOSURE TO ASBESTOS*, 310, 320 (1985); Seidman, Selikoff, and Gelb, *Mortality Experience of Amosite Asbestos Factory Workers: Dose-Response Relationships 5 to 40 Years After Onset of Short-Term Work Exposure*, AM J IND MED 10:479-514, 480 (1986); Newhouse

& Thompson, *Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area*, BR J IND MED 22:261-66 (1965); Greenburg & Davies, *Mesothelioma Register 1967-68*, BR J IND MED 31:91-104 (1974).

In 2001, the Agency for Toxic Substances and Disease Registry (“ATSDR”) noted that the EPA “calculated that lifetime continuous exposure to asbestos air concentrations of 0.0001 fiber/mL could result in up to 2-4 cancer deaths (lung cancer or mesothelioma) per 100,000 people.” ATSDR, “Chemical-Specific Health Consultation: Tremolite Asbestos and Other Related Types of Asbestos,” at 3-4 (Sept. 2001). In other words, exposures as low as 0.0001 fiber/ml could cause excess mesothelioma deaths.

Asbestos-related mesothelioma, like other diseases caused by the inhalation of asbestos, is a dose response disease—meaning that increasing levels of exposure increase the risk of contracting the disease—even at low levels. The National Research Council calculated that a cumulative dose of 0.03 f/cc-years would result in 9 cases of mesothelioma per million person years. *See* National Research Council, Committee on Nonoccupational Health Risks of Asbestiform Fibers, *Asbestiform Fibers: Nonoccupational Health Risks*, National Academy Press 212 (1984). At a higher cumulative dose of 0.146 f/cc-years, there was a five-fold increased risk. *Id.*

In addition, a large case-control study conducted in France, the authors found that, “[a] significant excess of mesothelioma was observed for levels of cumulative exposure that were probably far below the limits adopted in many industrial countries during the 1980s.” **Ex. 19**, Iwatsubo, et al, *Pleural Mesothelioma: Dose-Response Relation at Low Levels of Asbestos Exposure in a French Population-based Case-Control Study*, AM J EPID 148(2):122-142 (1998). The findings of Iwatsubo were replicated by Dr. Rodelsperger and his colleagues, who observed a “distinct dose-response relationship even at levels of cumulative exposure below 1 fiber year.” **Ex. 20**, Rodelsperger et al., *Asbestos and Man-Made Vitreous Fibers as Risk Factors for Diffuse Malignant Mesothelioma: Results From a German Hospital-Based Case-Control Study*, AM J INDUS MED 39: 262-275, 262 (2001); *see also* **Ex 53**, Rolland, *Risk of pleural mesothelioma: A French population-based case-control study (1998-2002)* (Oct. 20, 2006).

The importance of each significant exposure is highlighted by the inverse relationship between

the amount of asbestos inhaled and the time period in which a mesothelioma will develop if it is going to develop. The lower the dose, the longer the latency period. *See e.g., Ex. 46, Bianchi, Latency periods in asbestos-related mesothelioma of the pleura, EUR J CANCER PREV 6:162-166 (1997); Ex. 57, Lin et al., Ecological association between asbestos-related diseases and historical asbestos consumption: an international analysis, Lancet 369:844-849 (2007); Ex. 65, Pan et al., Residential Proximity to Naturally Occurring Asbestos and Mesothelioma Risk in California, Am J Respir Crit Care Med 172:1019-1025 (2005).*

Thus, as demonstrated by this abundant scientific literature, Dr. Mark's opinion that mesothelioma is caused by cumulative asbestos exposure and that all special exposures are substantial contributing factors in contributing to the total exposure and causing an individual's mesothelioma, is not his own unfounded theory but rather is a summation of medical facts found in the peer-reviewed and published literature. Recently, Dr. Laura Welch and 51 other scientists, researchers and medical professionals representing "hundreds of years of experience researching, diagnosing, and treating asbestos-related disease in workers and their families," published a paper outlining the consensus of the mainstream scientific community regarding the causation of asbestos-related disease. **Ex. 21, Welch, Asbestos Exposure Causes Mesothelioma, But Not *This* Asbestos Exposure: An Amicus Brief to the Michigan Supreme Court, INT J OCCUP ENVIRON HEALTH 13:318-327 (2007).** These fifty-two independent experts explained that, "[t]he mainstream scientific community has long recognized and continues to recognize today that there is no 'safe' level of exposure to asbestos." *Id.* at 319. The scientists concluded that, "the consensus of the scientific community is that any occupational or para-occupational exposure to asbestos - even 'brief or low-level exposures' - must be considered causal in an individual with a mesothelioma." *Id.* at 321 (emphasis added).

Further undermining Defendants' contention that Dr. Mark's opinions are not generally accepted in the scientific community is the fact that experts who frequently testify for both plaintiffs and defendants in the asbestos litigation share the same views. For example, Dr. Victor Roggli, Defendants' expert in this case, has written in the published, peer-reviewed literature that "[e]pidemiologic studies

have shown that mesothelioma can develop years after brief or low level exposures.” **Ex. 22**, Roggli, *Human Disease Consequences of Fiber Exposures: A Review of Human Lung Pathology and Fiber Burden Data*, ENV HEALTH PERSPECTIVES 88:295-303, 298 (1990). In addition, as discussed *supra*, Dr. Roggli has also expressed the opinion that there is no known level of exposure to asbestos below which mesothelioma will not occur, that it is the total dose of asbestos, regardless of fiber type, that the patient experiences that causes the disease, and that each and every exposure to asbestos above background levels is a substantial contributing factor in causing mesothelioma. Roggli Affidavit, 5/29/01, at 2. Defense expert Dr. Andrew Churg, a pathologist, has also testified “that a single exposure to asbestos can cause mesothelioma, with each subsequent exposure exponentially increasing the risk of disease.” *Purcell v. Asbestos Corp. Ltd.*, 959 P.2d 89, 93 (1998), *modified on other grounds*, 963 P.2d 729 (1998).

B. There is a scientific consensus that chrysotile asbestos causes mesothelioma.

Defendants’ suggestion that there is any doubt about the ability of chrysotile asbestos to cause mesothelioma is not based on sound science and should be rejected by this Court. As noted in the Introduction, Honeywell’s own expert, Dr. Roggli, and Honeywell itself, have recognized that chrysotile asbestos causes mesothelioma.

Scientists have concluded that both chrysotile and amphibole fibers are capable of causing mesothelioma in human beings. *See, e.g., Ex. 55*, Langer and Nolan, *Asbestos in the lungs of persons exposed in the USA*, Monaldi Arch Chest Dis 53(2):168-180 (Apr. 1998); Pathology of Asbestos-associated Diseases 108 (Roggli, et al., eds., 2nd ed. 2004) (“[I]t is clear that sufficient exposure to chrysotile may result in the development of mesothelioma”); Lemen, *Chrysotile Asbestos as a Cause of Mesothelioma: Application of the Hill Causation Model*, Int’l J. Occup. Envtl. Health 10:233-239 (2004) (There is “no doubt that the scientific evidence supports the carcinogenicity of chrysotile alone in the induction of mesothelioma.”); Harrington, *The Carcinogenicity of Chrysotile Asbestos*, in *The Third Wave of Asbestos Disease: Exposure to Asbestos in Place* (Landrigan & Kazemi, eds. 1991) 465, at 470 (“[C]hrysotile asbestos is carcinogenic in humans, especially for the induction of lung cancer and mesothelioma in exposed populations”; Li et al., *Cohort Studies on Cancer Mortality Among*

Workers Exposed Only to Chrysotile Asbestos: A Meta-Analysis, Biomedical & Env'tl. Sci. 17:459-68 (2004) (reporting, based on meta-analysis of multiple epidemiological studies, that exposure to chrysotile fibers alone increased risk of mesothelioma); Pathology of Occupational Lung Disease 351 (Churg & Green eds., 2nd ed. 1998) ("These observations leave no doubt that enough exposure to chrysotile ore can produce mesothelioma in man."); Selikoff & Lee, Asbestos and Disease 280 (1978); Landrigan, et al., *The Hazards of Chrysotile Asbestos: A Critical Review*, Indus. Health 37:271-280 (1999) (reviewing 40 studies of workers exposed to asbestos and concluding that "[c]linical and epidemiologic studies have established beyond all reasonable doubt that chrysotile asbestos causes cancer of the lung" and "malignant mesothelioma of the pleura and peritoneum . . .").

In 1996, Drs. Smith and Wright concluded that "[c]hrysotile asbestos is a potent cause of pleural mesothelioma." **Ex. 23**, Smith and Wright, *Chrysotile Asbestos Is the Main Cause of Pleural Mesothelioma*, AM J IND MED 30:252-266, 255 (1996). The authors found that exposure to chrysotile asbestos "even at the relatively low levels expected in household exposures, can cause malignant mesothelioma." *Id.* In 2011, a survey of the literature found at least thirty "studies and cases from all over the world, where the overwhelming evidence is that chrysotile asbestos was the primary or only asbestos exposure." **Ex. 24**, Kanarek, *Mesothelioma from Chrysotile Asbestos: Update*, ANN EPIDEMIOL 21:688-697, 695 (2011). The authors concluded that "[t]here are many well-documented cases of mesothelioma from chrysotile asbestos in case-reports and epidemiology studies from all over the world." *Id.* at 695.

Indeed, virtually every group of scientists that has ever examined the question has found that reliable data show a causal relationship between chrysotile asbestos and mesothelioma. As discussed *supra*, in 1997, an interdisciplinary group of epidemiologists, pathologists, industrial hygienists and other experts on asbestos-related disease gathered in Helsinki, Finland. The consensus among the scientists was that both chrysotile and amphibole fibers are capable of causing mesothelioma in human beings. *See* Consensus Report, *supra*.

In 1979, the highly respected International Agency for Research on Cancer (IARC) published a monograph reporting that all types of commercial asbestos fibers had been found to product

mesothelioma. IARC Monograph (Sept. 1979). The IARC, which is generally considered the leading scientific authority on carcinogenic substances, follows a rigorous and comprehensive review process. The original IARC Monograph on asbestos was developed by the world's leading authorities on asbestos research, including Dr. Irving Selikoff and Dr. J.C. Wagner. IARC met again in 2009 to reassess the carcinogenicity of asbestos. A group of 27 international scientists concluded that, "[e]pidemiological evidence has increasingly shown an association of all forms of asbestos (chrysotile, crocidolite, amosite, tremolite, actinolite, and anthophyllite) with an increased risk of lung cancer and mesothelioma." **Ex. 25**, *A Review of Human Carcinogens – Part C: Metals, Arsenic, Dust, and Fibres*, THE LANCET, 10:453-454 (2009). In 2012, these conclusions were included in the updated IARC monograph on asbestos.

On June 4, 2012, the Joint Policy Committee of the Societies of Epidemiology issued its Position Statement on Asbestos. **Ex. 26**, Joint Policy Committee of the Societies of Epidemiology, *Position Statement on Asbestos*, at 2 (2012). This is a consortium of epidemiology societies and organizations, both national and international, including the American College of Epidemiology. This consortium of epidemiological societies found that "[a] large number of studies have reported an excess of mesothelioma and lung cancer among workers who were predominantly exposed to chrysotile asbestos," *id.* at 11, and that "evidence from other scientific disciplines also demonstrates that chrysotile alone causes not only lung cancers (and asbestosis), but also pleural and peritoneal mesothelioma." *Id.* at 13.

In 1998, the WHO's International Programme on Chemical Safety (IPCS) published an exhaustive report on chrysotile asbestos. After analyzing data from more than 400 scientific articles, the IPCS concluded that "[c]ommercial grades of chrysotile have been associated with an increased risk of pneumoconiosis, lung cancer and mesothelioma in numerous epidemiological studies of exposed workers." **Ex. 49**, WHO, *Environmental Health Criteria 203: Chrysotile Asbestos* (1998) ("EHC 203"), at ¶ 1.6. The report analyzed all of the available scientific data, including epidemiological studies, tissue studies, and repeated *in vivo* and *in vitro* experiments. The data demonstrated that "[e]xposure to chrysotile asbestos poses increased risks for asbestosis, lung cancer and mesothelioma in a dose-dependent manner" and that no "threshold has been identified for carcinogenic risks." *Id.* at ¶ 10.

In 2004, the American Cancer Society's revised guide to mesothelioma stated that, "the more commonly used chrysotile fibers are associated with malignant mesotheliomas and should be considered dangerous as well." American Cancer Society, *Detailed Guide: Malignant Mesothelioma* (Dec. 21, 2004).

Regulatory agencies throughout the world have relied on a body of scientific evidence linking chrysotile asbestos and mesothelioma. In 2000, the World Trade Organization gathered an independent panel of scientists to assess the health effects of chrysotile asbestos, in order to determine whether Canada should be permitted to export chrysotile. The assembled scientists agreed that chrysotile asbestos caused mesothelioma. *See, e.g.,* WTO Report, *supra*, at ¶ 5.267. The WTO Panel concluded that chrysotile products posed a health risk to "downstream" users, "in particular as regards lung cancer and mesothelioma." *Id.* at ¶ 8.194.

Governmental agencies in the United States have reached the same conclusion. In 1977, the Consumer Product Safety Commission (CPSC) banned an entire class of joint compounds containing chrysotile asbestos, finding that the products posed an "unreasonable risk of injury to the public." **Ex. 47**, 16 C.F.R. § 1304.5. Specifically, the Commission found that the products posed the risk of causing both lung cancer and mesothelioma.

In 1986, after reviewing 55,000 pages of epidemiological studies, scientific articles and voluminous testimony "concerning the toxicity and carcinogenicity of different asbestos fiber types," OSHA determined that "all fiber types, alone or in combination, have been observed in studies to induce lung cancer, mesothelioma, and asbestosis in exposed workers." OSHA, *Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite; Final Rules*. In 1994, OSHA again reviewed the scientific evidence and reaffirmed its original conclusion that chrysotile asbestos presented a significant mesothelioma risk to exposed workers. In 2014, OSHA again published that "[e]pidemiological evidence has increasingly shown that all asbestos fiber types, including the most commonly used form of asbestos, chrysotile, causes mesothelioma in humans." **Ex. 63**, OSHA: Asbestos (2014).

In 1989, the EPA relied on both the epidemiological studies and “numerous animal studies [that] have demonstrated that chrysotile is at least as potent as amphiboles in inducing both mesothelioma and lung cancer by inhalation, as well as by injection or implantation.” EPA, *Asbestos: Manufacture, Importation, Processing and Distribution in Commerce Prohibitions; Final Rule*. The EPA reviewed the scientific literature on chrysotile again in 1999 and 2000 and found nothing “that persuasively contradicted the risk assessment approach” with respect to chrysotile asbestos. EPA, *Asbestos Worker Protection, Final Rule* (Nov. 15, 2000).

The U.S. Mine Safety and Health Administration has rejected the notion that the risk of mesothelioma differs by fiber type, choosing to treat all six asbestos minerals the same. **Ex 48**, MSHA, *Asbestos Exposure Limit; Final Rule*, 73 Federal Register 41, 11291-92 (Feb. 29, 2008). In 1997, the U.S. Department of Health and Human Services stated that “both epidemiologic evidence and experimental confirmation indicate that chrysotile, amosite, and crocidolite asbestos are causative agents for mesothelioma.” U.S. Dep’t of Health and Human Services, *Asbestos Bibliography* (Sept. 1997), at 86. In 1998, the NIOSH reiterated that chrysotile causes mesothelioma, and “[t]herefore, all occupational groups exposed to asbestos are at risk of developing asbestos-related pleural malignancy.” NIOSH, *Atlas of Respiratory Disease Mortality, United States: 1982-1993*.

Published epidemiological studies demonstrate significantly increased rates of mesothelioma, often more than double what was expected in chrysotile-exposed populations.⁶ The WHO reviewed the extensive epidemiological literature in 1998 and concluded that “[c]ommercial grades of chrysotile have been associated with an increased risk of pneumoconiosis, lung cancer and mesothelioma in numerous epidemiological studies of exposed workers.” EHC 203, *supra*, at ¶ 1.6. The report further notes that although epidemiological studies have primarily involved the mining, milling and manufacturing sectors,

⁶ Tissue studies also establish the carcinogenicity of chrysotile asbestos. There is “good evidence from lung burden studies . . . that chrysotile alone can cause mesothelioma.” Malignant Mesothelioma 230 (Henderson, et al., eds. 1992). Studies of human tissue demonstrate that chrysotile fibers concentrate in the pleura, where most mesotheliomas develop. See **Ex. 45**, Suzuki & Yuen, *Asbestos Tissue Burden Study on Human Malignant Mesothelioma*, Indus. Health 39:150-160 (2001).

“there is evidence, based on the historical pattern of disease associated with exposure to mixed fibre types in western countries, that risks are likely to be **greater** among workers in construction and possibly other user industries.” *Id.* (emphasis added). In 2006, the WHO unequivocally stated that, “all types of asbestos cause asbestosis, mesothelioma, and lung cancer.” WHO Position on Asbestos, May 5, 2006. The WHO concluded that “[e]xposure to chrysotile asbestos poses increased risks for asbestosis, lung cancer and mesothelioma in a dose-dependent manner” and that no “threshold has been identified for carcinogenic risks.” EHC 203, *supra*, at ¶ 10.

Several studies have confirmed that chrysotile asbestos alone is associated with an increase risk of mesothelioma. *See, e.g., Ex. 43*, Robinson, *Advances in Malignant Mesothelioma*, N Engl J Med 353(15):1591 (Oct. 2005); *Ex. 44*, R.P. Everatt et al., *Occupational Asbestos Exposure Among Respiratory Cancer Patients in Lithuania*, Am. J. Indus. Med., Supplement 50:455-463, 457, 462 (2007); *Ex. 50*, S.V. Kashansky et al., *Retrospective View of Airborne Dust Levels in Workplace of a Chrysotile Mine in Ural, Russia*, Indus. Health, 39:51-56 (2001); *Ex. 51*, S.V. Shcherbakov et al., *The Health Effects of Chrysotile Asbestos: Contribution of Science to Risk-Management Decisions*, Can. Mineral., Spec. Publ. 5:187-198 (2001); *Ex. 52*, Tossavainen et al., *Health and Exposure Surveillance of Siberian Asbestos Miners: A Joint Finnish-American-Russian Project*, Am J Ind Med Supp 1:142-144 (1999); *Ex. 54*, Frank et al., *Carcinogenic Implications of the Lack of Tremolite in UICC Reference Chrysotile*, Am J Ind Med 34:314-317 (1998); *Ex. 56*, Cullen and Baloyi, *Chrysotile Asbestos and Health in Zimbabwe: Analysis of Miners and Millers Compensated for Asbestos-Related Disease Since Independence (1980)*, Am J Ind Med 19:161-169 (1991); *Ex. 66*, Sturm et al., *Use of asbestos, health risks and induced occupational diseases in the former East Germany*, Toxicology Letters 72:317-324 (1994); M.T. Madkour, *Environmental exposure to asbestos and the exposure-response relationship with mesothelioma*, E. Mediterranean Health J. 15(1):25-38, 32 (2009); D. Loomis et al., *Lung cancer mortality and fibre exposures among North Carolina asbestos textile workers*, Occup and Envir Med. 66(8):535-542 (Aug. 2009); G. Aguilar-Madrid, *Case-control Study of Pleural Mesothelioma in Workers with Social Security in Mexico*, Am. J. Indus. Med. 53:241-251, 242 (2010). In sum, there is

overwhelming scientific consensus for Dr. Mark's opinion that chrysotile asbestos causes mesothelioma.

C. It is generally accepted in the medical and scientific community that exposure to asbestos-containing brake dust causes mesothelioma.

Contrary to Honeywell's contention that "the available epidemiology does not support an increased risk of mesothelioma among automotive mechanics," (Doc. 296 at 28), there are numerous epidemiological studies finding an increased risk of mesothelioma in individuals who have breathed brake dust. Recently, a published, peer-reviewed epidemiological study found that auto mechanics had a statistically significant risk of developing mesothelioma. **Ex. 27**, Roelofs et al., *Mesothelioma and Employment in Massachusetts: Analysis of Cancer Registry Data 1988-2003*, Am J Indus Med 56(9):985-992, Table II (2013). It was noted that auto mechanic exposure was from cleaning asbestos-containing vehicle brakes. *Id.* at 7. Similarly, in the recent survey of chrysotile literature by Kanarek, cited *supra*, the authors concluded that exposure to chrysotile asbestos in brake friction products causes mesothelioma. They noted that low exposures are capable of causing mesothelioma, and that it is "universally accepted that it takes a greater exposure to asbestos to cause asbestosis than the amount needed for mesothelioma carcinogenicity." Kanarek, *supra*, at 696. The authors therefore concluded that, "**in worker groups, like brake workers, where there has been excess asbestosis, these workers have definitely been exposed to asbestos levels enough for mesothelioma carcinogenicity.**" *Id.* (emphasis added).

Mesothelioma is commonly seen in cohorts that include auto mechanics. **Ex. 69**, Leigh, *Malignant Mesothelioma in Australia, 1945-2000*, Am J Ind Med 41:188-201 (2002); **Ex. 71**, Rosler and Woitowitz, *Recent Data on Cancer Due to Asbestos in Germany*, Med Lav 86(5):440-448 (1995); **Ex. 72**, Jung et al., *A Decade of Malignant Mesothelioma Surveillance in Korea*, Am J Ind Med (2012); **Ex. 75**, Langer, *Mesothelioma in a Brake Repair Worker*, Lancet (Nov. 13, 1982).

Numerous other scientific publications have also found that exposure to asbestos brake friction products is hazardous and increases the risk of disease. *See Ex. 28*, McDonald, et al, *Epidemiology of Primary Malignant Mesothelial Tumors in Canada*, Cancer, 26(4):914-9 (1970); **Ex. 29**, Vianna & Polen, *Non-Occupational Exposure to Asbestos and Malignant Mesothelioma in Females*, The Lancet, May

1978; **Ex. 30**, Report of the Panel, European Communities – Measures Affecting Asbestos and Asbestos-Containing Products, WTO September 18 2000; **Ex. 76**, Hansen, *Mortality of auto mechanics: A ten-year follow-up*, Scand J Work Environ Health, 15:43-46 (1989); **Ex. 58**, Lorimer et al., Asbestos Exposure of Brake Repair Workers in the United States, Mt Sinai J 43(3):207-218 (1976); **Ex. 70**, Finkelstein and Meisenkothen, *Malignant Mesothelioma Among Employees of a Connecticut Factory that Manufactured Friction Materials Using Chrysotile Asbestos*, Ann Occup Hyg 54(6):692-696 (2010).

Studies have found large amounts of chrysotile asbestos fibers present in brake dust. **Ex. 59**, Atkinson et al., *Evaluation of the Size and Type of Free Particulates Collected from Unused Asbestos-Containing Brake Components as Related to Potential for Respirability*, Am J Ind Med 46:545-553 (2004). Studies have also documented substantial asbestos exposures from brake dust. **Ex. 60**, Salazar et al., *Asbestos Exposure among Transmission Mechanics in Automotive Repair Shops*, Ann Occup Hyg 1-15 (2014); **Ex 61**, Garcia-Gomez et al., *Asbestos-related occupational cancers compensated under the Spanish National Insurance System, 1978-2011*, Intl J Occup Env Health 21(1):31-39 (2015); *see also* **Ex. 62**, Friction Materials Standards Institute, Minutes of Asbestos Study Committee, Feb. 16, 1973. Little wonder since Ford actually instructed mechanics to remove dust from the brake drum with an air house and to sand or abrade new brake linings to eliminate noise. **Ex. 77**.

Despite this body of scientific evidence, Honeywell makes the unfounded and unequivocal claim that any conclusion that exposure to asbestos from brakes has caused mesothelioma, a signature asbestos-related disease, is not supported by any positive epidemiologic studies. Such a sweeping pronouncement is not only factually and legally incorrect but “veers from accepted, reliable mainstream scientific methods and conclusions.” Welch, *supra*, at 321. Having reviewed the publications and the arguments and evidence commonly offered by brake defendants that asbestos in brakes is harmless and incapable of causing disease, 52 eminent pathologists, epidemiologists, toxicologists, public health physicians and other scientists engaged in the field of asbestos and asbestos diseases from prestigious universities and colleges throughout the world concluded that this assertion “is simply not scientifically supportable.” *Id.* These experts first note that the studies relied upon by the Defendants are fraught with individual

shortcomings that limit their applicable universality citing peer-reviewed criticisms. *See, e.g., Exs. 73-74.* They then relate that, “[f]ar from proving that no person can ever get sick from asbestos dust released by brakes, the best that can be said for the studies is that they are inconclusive. Instead, such a claim is based on the scientifically unsupportable proposition that one study, or group of studies, trumps all other evidence, no matter how extensive and well-documented that evidence is.” Welch, *supra*, at 321.

These 52 scientists, while acknowledging that the epidemiology with respect to mesothelioma and workers exposed to asbestos from brakes is inconclusive, state that:

The scientific literature contains hundreds of cases of mesothelioma among brake mechanics; and epidemiologic studies of mechanics known to have performed repair work on asbestos-containing brakes have demonstrated increased levels of nonmalignant diseases. This combination of evidence, and the vast amount of additional scientific information regarding asbestos and mesothelioma, provides more than sufficient evidence to allow someone to conclude within a reasonable degree of scientific certainty that a mesothelioma in a mechanic who worked with asbestos-containing brakes was caused by that asbestos exposure.

Id. at 323 (emphasis added). They then conclude that, “[d]espite the best efforts of the asbestos brake manufacturers and their hired experts to fabricate scientific uncertainty where none exists, the mainstream scientific community and regulatory communities have considered the available evidence and concluded that the danger to mechanics from asbestos in brakes is real.” *Id.*

The EPA has also declined to accept the brake industry’s claims about the safety of their products. When it was first published in 1986, the EPA “Gold Book,” an informational pamphlet on brake maintenance and asbestos disease, advised anyone working with asbestos brakes that mesothelioma “can be caused by very low exposures to asbestos” and that “[t]his cancer has occurred among brake mechanics, their wives, and their children.” **Ex. 31**, Guidance for Preventing Asbestos Disease Among Auto Mechanics, EPA, at 2 (1986). Recently, attorneys representing the automobile industry formally requested that the EPA eliminate this language and revise the pamphlet to reflect the “new” science. **Ex. 32**, Michaels & Monforton, *How Litigation Shapes the Scientific Literature: Asbestos and Disease Among Automobile Mechanics*, Journal Law Pol’y, XV(3): 1137-1169 (2007). The EPA, however, declined to do so and its revised brochure did not mention anything about asbestos brake dust being incapable of causing

any type of disease. **Ex. 33**, Current Best Practices for Preventing Asbestos Exposure Among Brake and Clutch Repair Workers, EPA (2007); *see also* **Ex. 34**, Asbestos-Automotive Brake and Clutch Repair Work, OSHA (2006) (exposure to asbestos from brakes can cause mesothelioma *citing* Lemen, *Asbestos in Brakes: Exposure and Risk of Disease*, *Amer J Ind Med* 45:229-237 (2004)).

It should also be noted that in 2005, the International Journal of Occupational and Environmental Health (in conjunction with a number of leading doctors and scientists) published an article entitled *Abuse of Epidemiology: Automobile Manufacturers Manufacture a Defense to Asbestos Litigation*. The article notes that “much of the ‘debate’ about the relationship between asbestos exposure from automobile brake work and asbestos-induced cancer has been fueled by studies that have been funded by corporations with billions at stake in tort litigation. The authors explore how asbestos-lined brake manufacturers have corrupted medical literature to escape liability, analyzing studies funded by these companies to enable them to claim that work with asbestos brake linings never causes mesothelioma” **Ex. 35**, Egilman, M.D., et al., *Abuse of Epidemiology: Automobile Manufacturers Manufacture a Defense to Asbestos Litigation*, *Int’l J. Occup. & Environ Health*, 11:360-371 (2005).

Yet another article addressing the efforts (and techniques) employed by manufacturers to distort and misrepresent the well-accepted causal relationship between exposure to asbestos and asbestos-related malignancies is Freeman and Kohles, *Assessing specific causation of mesothelioma following exposure to chrysotile asbestos-containing brake dust*, *Int’l J Occup Env Health* 18(4):329-336 (2012), **Ex. 36**. The authors address the “debate” about whether exposure to brake dust causes mesothelioma, noting that “[i]t is unlikely that this debate would exist if it were not for defective product litigation that is associated with individual mesothelioma and asbestos exposure claims.” *Id.* at 329. In the face of the scientific consensus that exposure to asbestos brakes increases the risk of mesothelioma, brake manufacturers employ “doubt science” by arguing that there is not in fact convincing evidence that brake exposure causes mesothelioma. *Id.* at 330. The specific arguments made by the brake industry have been rejected by many scientists “as irrelevant, biased, misleading, sophistic, and flat out incorrect.” *Id.* The authors set out to examine the specific claims made by the brake industry, and Defendants in this case, to determine

whether they had any validity, and found that, “[i]t is reasonable to conclude that the ‘net’ of evidence supporting a causal nexus between brake dust exposure and mesothelioma favors causation, and that the weak ‘strands’ indicated by industry scientists as evidence to the contrary either do not exist or are greatly outweighed by the evidence to the contrary.” *Id.* at 332. They further conclude that the brake industry’s contention that chrysotile does not cause mesothelioma “is, in fact, specious.” *Id.* at 335.

V. DR. MARK’S OPINIONS HAVE BEEN ADMITTED BY OTHER COURTS AS RELIABLE AND HELPFUL TO THE TRIER OF FACT.

A. Dr. Mark’s causation opinions have been widely accepted by courts across the country.

The federal asbestos MDL has repeatedly ruled that the opinion that every exposure to asbestos above background levels contributes to cause mesothelioma satisfies the *Daubert* admissibility standard for expert testimony. *See Rabovsky v. Air & Liquid Sys. Corp.*, No. 10-cv-03202, 2012 U.S. Dist. LEXIS 9169 (E.D. Penn. Jan. 25, 2012), *affirmed by* 2012 U.S. Dist. LEXIS 34085 (E.D. Penn. Mar. 13, 2012); *Schumacher v. Amtico*, No. 5:10-1627, 2010 U.S. Dist. LEXIS 144831 (E.D. Pa. Nov. 2, 2010); *Larson v. Bondex Int’l*, No. 09-69123, 2010 U.S. Dist. LEXIS 123090 (E.D. Penn. Nov. 15, 2010); *Anderson v. Saberhagen Holdings, Inc.*, No. 10-cv-61118, 2011 U.S. Dist. 15870 (E.D. Penn. Feb. 16, 2011).

In *Schumacher*, the court found that Dr. John Maddox had used a reliable methodology in reaching this opinion. He relied on a variety of peer-reviewed studies, including the Consensus Report, and considered the amount of fibers released from working with the products at issue. *Id.* at *5-*6. The court noted that there is a significant body of published literature regarding what level of asbestos exposure can cause mesothelioma and that there is a legitimate debate within the scientific community regarding what that threshold level is (and indeed, whether a numeric threshold is even ascertainable). *Id.* at *7. Although the plaintiff’s expert took one position in that debate and the defendant’s expert took the opposite position, that does not make the plaintiff’s expert’s opinion unreliable or inadmissible. *Id.* at *7-*8. Rather, the defendant’s criticisms of the opinions were simply “fodder for cross-examination, and do not preclude the admissibility of [the] opinion.” *Id.* at *7; *see also Rabovsky*, 2012 U.S. Dist. LEXIS 34085, at *12-*14; *Rabovsky*, 2012 U.S. Dist. LEXIS 9169, at *15-*18.

The opinions in *Schumacher* and *Rabovsky* are consistent with a recent federal court opinion admitting Dr. Mark's causation testimony in *Bobo v. TVA*, No. 12-S-1930-NE, 2014 U.S. Dist. LEXIS 117917, at *24-*28 (N.D. Ala. Aug. 25, 2014) (**Ex. 15**). There, Judge Lynwood Smith rejected a challenge to Dr. Mark's opinion, determining not only that he does not hold the "every exposure" opinion as defendants claimed, but also that the court did "not find Dr. Mark's opinions regarding the cumulative nature of asbestos diseases and the effect that each significant exposure of asbestos has on the development of such diseases to be inherently unreliable." *Id.* at *27. The court noted that Dr. Mark was relying on evidence of the plaintiff's exposure history, as well as "ample citations to scientific literature and studies to support each of the underlying bases to his opinion." *Id.* He further noted that Dr. Mark "relied on numerous epidemiological studies finding that even relatively low cumulative exposures to asbestos can cause mesothelioma." *Id.*; *see also Quirin v. Lorillard Tobacco Co.*, 2014 U.S. Dist. LEXIS 26218, at *9-*10 (N.D. Ill. Feb. 28, 2014).

In 1973, the Fifth Circuit Court of Appeals observed that it has been "established that the effect of exposure to asbestos dust is cumulative, that is, each exposure may result in an additional and separate injury." *Borel*, 493 F.2d at 1094. Many cases from many other jurisdictions are in accord, and have admitted expert testimony to this effect. *See Caruolo v. A C & S, Inc.*, 1999 U.S. Dist. LEXIS 3022, at *25-*28 (S.D.N.Y. Mar. 11, 1999); *Blancha v. Keene Corp.*, 1991 U.S. Dist. LEXIS 15394, *15-*16 (E.D. Pa. Oct. 23, 1991); *John Crane, Inc., v. Linkus*, 988 A.2d 511, 523-24 (Md. App. 2010); *Jones v. John Crane, Inc.*, 35 Cal. Rptr. 3d 144, 151 (Cal. App. 2005); *AC & S, Inc. v. Abate*, 710 A.2d 944, 988 (Md. App. 1998), *abrogated on other grounds by John Crane, Inc. v. Scribner*, 800 A.2d 727 (2002); *John Crane, Inc. v. Wommack*, 489 S.E.2d 527, 541 (Ga. Ct. App. 1997); *Mavroudis v. Pittsburgh-Corning Corp.*, 935 P.2d 684, 689 (Wash. 1997); *Kurak v. A.P. Green Refractories Co.*, 689 A.2d 757, 761 (N.J. Super. Ct. App. Div. 1997); *Held v. Avondale Industries, Inc.*, 672 So.2d 1106, 1109 (La. App. 1996).⁷

⁷ Moreover, many courts have concluded that mesothelioma is a unique disease that can be caused by even short or minimal exposures to asbestos. *See Tragarz v. Keene Corp.*, 980 F.2d 411, 420 (7th Cir.

Numerous courts have also admitted the scientific opinion, as expressed by Dr. Mark in this case, that exposure to asbestos brakes contributes to cause mesothelioma. *See General Motors Corp. v. Grenier*, 981 A.2d 531, 535 (Del. 2009) (upholding the admission of expert causation testimony that an auto mechanic's mesothelioma was caused by his exposure to asbestos from brakes); *Chapin v. A & L Parts, Inc.*, 732 N.W.2d 578 (Mich. App. Ct. 2007) (affirming a trial court's decision upholding the reliability of an expert's opinion that exposure to asbestos brake dust can cause mesothelioma); *Klima v. Volkswagen of America, Inc., et al.*, No. A095614, 2003 WL 22172417, at *9 (Cal. App. Sept. 22, 2003) (admitting expert testimony that "bystander" exposure to nine brake jobs was sufficient to establish causation given the strong causal link between asbestos and mesothelioma in the scientific literature).

B. The cases cited by Defendants do not support their position that Dr. Mark's testimony should be excluded.

Despite the fact that Dr. Mark's opinions are consistent with the consensus view on the causation of asbestos-related disease, and the type of causation opinions he has expressed have repeatedly been recognized as reliable and admissible expert testimony, Defendants have offered critiques based on a few cases that have excluded or criticized similar causation testimony.

The cases cited by Defendants are unpersuasive for numerous reasons, the first being that they present very different facts. For example, in both *Betz v. is Pneumo Abex, LLC*, 44 A.3d 27 (Pa. 2012), and *Anderson v. Ford Motor Co.*, No. 2:06-cv-741 TS, 2013 U.S. Dist. LEXIS 88457 (D. Utah June 24, 2013), the courts' primary concern was that the experts had testified about specific causation without any reference to the individual exposure history of the plaintiff. *Betz*, 44 A.3d at 55; *Anderson*, 2013 U.S. Dist. LEXIS 88457, at *8, *11, *15, *19. That is obviously not the case here, where Dr. Mark bases his opinion on Yates's testimony regarding his work with and around Defendants' asbestos brakes in a manner that exposed him to brake dust, over a duration of many years.

The Texas cases relied on by Defendants are also inapplicable because they are addressing an

1992); *McAskill v. Am. Marine Holding Co.*, 9 So. 3d 264, 268 (La. Ct. App. 2009); *Georgia-Pacific Corp. v. Pransky*, 800 A.2d 722, 725 (Md. 2002); *Harashe v. Flintkote Co.*, 848 S.W.2d 506, 508 (Mo. Ct. App. 1993); *Sheffield v. Owens-Corning Fiberglass Corp.*, 595 So. 2d 443, 456 (Ala. 1992).

“any exposure” theory that is not at issue here. Defendants’ citation of the Washington case *Free v. Ametek* is also highly misleading and is not representative of that state’s approach to this issue. In 2006, the King County asbestos judge (with a docket of hundreds of asbestos cases in Seattle) held a lengthy *Frye* hearing, denied the motion to exclude the plaintiff’s expert’s opinion regarding causation of mesothelioma from low levels of asbestos exposure, and noted that other courts have accepted testimony “to the effect that every exposure contributes, that it is a dose response disease and that the cumulative effect is what ultimately causes [] illness.” *Id.* at 81-82. **Ex. 37**, *Lott v. Bondex Int’l* hearing transcript, Nov. 6, 2006.

Although Defendants call Dr. Mark’s foundation “untestable,” the notion that Plaintiffs’ causation opinions cannot be tested is not dispositive. Defendants cite the trial court’s opinion in *Butler v. Union Carbide Corp.*, which faulted the plaintiff’s expert’s testimony because the court thought that there had not been adequate testing to establish a threshold exposure level for mesothelioma. *Butler* and other cases cited by Defendants misinterpret the experts’ reliance on the scientific literature showing that there is no known safe level of exposure to asbestos. Oddly, this is taken as an absence of data to support the experts’ opinions. *See Anderson*, 2013 U.S. Dist. LEXIS 88457, at *19-*20; *Smith v. Ford Motor Co.*, No. 2:08-cv-630, 2013 U.S. Dist. LEXIS 7861, at *7 (D. Utah Jan. 18, 2013). For example, in *Anderson* the court asserts that, “their testimony is based on their lack of information sufficient to show the level of exposure which does not create a risk of mesothelioma.” 2013 U.S. Dist. LEXIS, at *19.

The fallacy with this reasoning is identified in a recent decision by the Seventh Circuit, *Schultz v. Akzo Nobel Paints, LLC*, No. 12-1902, 2013 U.S. App. LEXIS 13059 (7th Cir. June 26, 2013). In this benzene exposure case, the defendant attacked the plaintiff’s expert’s opinion because he stated that there was no known threshold below which benzene exposure does not cause acute myeloid leukemia (“AML”), but had also identified the exposure level at which studies had found an elevated risk of AML. *Id.* at *8-*9, *14. The court explained that there is no inconsistency in these two positions: “The first says, in essence, that scientific studies confirm the danger of exposure to more than 10 ppm-years of benzene. The second says that no one is sure whether 10 ppm-years is the floor for risk, or 5 ppm-years,

or 1 ppm-year, or nothing.” *Id.* at *14. The Seventh Circuit disagreed with the trial court’s conclusion that the expert had found the amount of exposure to be “irrelevant,” given that the expert’s “unambiguous conclusion that [the plaintiff] had been exposed to a level of benzene that has been shown in studies to be a ‘very toxic and dangerous level.’” *Id.* at *15. The record in this case is equivalent to that found sufficient to support the expert’s opinion in *Schultz* because, as noted above, Dr. Mark has relied on Yates’s history of exposure and epidemiological studies finding that low cumulative occupational asbestos exposures increase the risk of mesothelioma several-fold.

Defendants also contend that the “each and every exposure” theory does not satisfy the substantial factor causation test. Besides the fact that Dr. Mark has not offered this opinion, this is another argument that suffers from flawed and simplistic reasoning. The asbestos MDL rejected this argument in the *Rabovsky* case, finding that the admissibility of the expert’s opinion is not really related to the sufficiency of the evidence question. 2012 U.S. Dist. LEXIS 34085, at *12-*13. This is because an asbestos plaintiff can rely on multiple types of evidence to meet her burden of proving causation, with her expert’s opinion being only one part of her case. As noted above, this Court’s gatekeeping function does not involve examining the correctness of the expert’s conclusions, but instead focuses on the reliability of the expert’s methodology. In fact, expert evidence “does not warrant exclusion simply because it fails to establish the causal link to a specified degree of probability.” *Ambrosini v. LaBarraque*, 101 F.3d 129, 135 (D.C. Cir. 1996). Rather, “[t]he dispositive question is whether the testimony will assist the trier of fact to understand the evidence or to determine a fact in issue, not whether the testimony satisfies the plaintiff’s burden on the ultimate issue at trial.” *Id.*

This distinction was made in the recent case of *Sweredoski v. Alfa Laval, Inc.*, 2013 R.I. Super. LEXIS 111 (R.I. Super. Ct. June 13, 2013). In a thorough analysis, the court considered the exact argument Defendants makes here, and determined that it did not warrant exclusion of the expert’s opinion. *Id.* at *24-*27. The court noted that the “every exposure” opinion alone would not be sufficient to satisfy the plaintiff’s causation burden, and that the plaintiff would naturally have to introduce evidence of sufficient exposure to the defendant’s product: “While a plaintiff may present ‘each and

every exposure’ evidence at trial to establish the inherent dangers of breathing in asbestos, such evidence will not satisfy the causation standard adopted here unless it is accompanied by sufficient evidence of the ‘frequency, regularity, and proximity’ of the plaintiff’s exposure to asbestos to establish that such exposure was a substantial factor in bringing about the plaintiff’s injury.” *Id.* at *27-*28.

In a similar vein, Defendants incorrectly contend that a necessary prerequisite to any causation determination is a quantitative evaluation of the respirable asbestos fibers that Yates inhaled from Defendants’ products. Defendants attempts to equate North Carolina law with the *Bostic* case from Texas case on this issue. North Carolina has not adopted the *Bostic* quantification requirement. Rather, in North Carolina, the standard is that a plaintiff in an asbestos action must demonstrate that he was “actually exposed” to the defendant’s asbestos-containing product. *Wilder v. Amatex Corp.*, 314 N.C. 550, 553-54, 336 S.E.2d 66, 68 (1985). Actual exposure is shown through application of the frequency, regularity, and proximity factors. *See Jones v. Owens-Corning Fiberglas Corp.*, 69 F.3d 712, 716 (4th Cir. 1995).

Dr. Mark has based his opinions on Yates’s history of years of brake exposure, as well as the industrial hygiene literature regarding the levels of exposure from working with asbestos brake friction products. Mark Report and Declaration, August 2013, at 4-7. He is also relying on numerous epidemiological studies finding that relatively low cumulative exposure levels can cause mesothelioma. *Id.* at 22-23, 28 (citing Iwatsubo and Rodelsperger studies, cited *supra*). Dr. Mark summed up that his opinions were based on the exposure evidence and Yates’s medical records, and “the medical and scientific literature concerning asbestos exposure and disease, available studies concerning fiber release, epidemiologic studies which correlate levels of exposure with disease, and my knowledge, skill, experience, and training as a physician.” Mark Report and Declaration, August 2013, at 29.

Thus, contrary to Defendants’ contentions, Dr. Mark’s opinions are well-supported by evidence regarding the amount of asbestos exposure Yates had from Defendants’ asbestos brake friction products, as well as the epidemiology documenting that low cumulative levels of exposure increase the risk of mesothelioma. Dr. Mark has a reliable scientific basis for his expert opinions in this case.

Respectfully Submitted,

/s/ Kevin W. Paul

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that on April 7, 2015, I electronically filed Plaintiffs' Response in Opposition to Defendant Honeywell International's Motion in *Limine* to Exclude Testimony that every Exposure to Asbestos Contributes to the Development of Disease, with the Clerk of Court using the CM/ECF system, which will send notification of such filing to all counsel of record.

/s/ Kevin W. Paul

Kevin W. Paul